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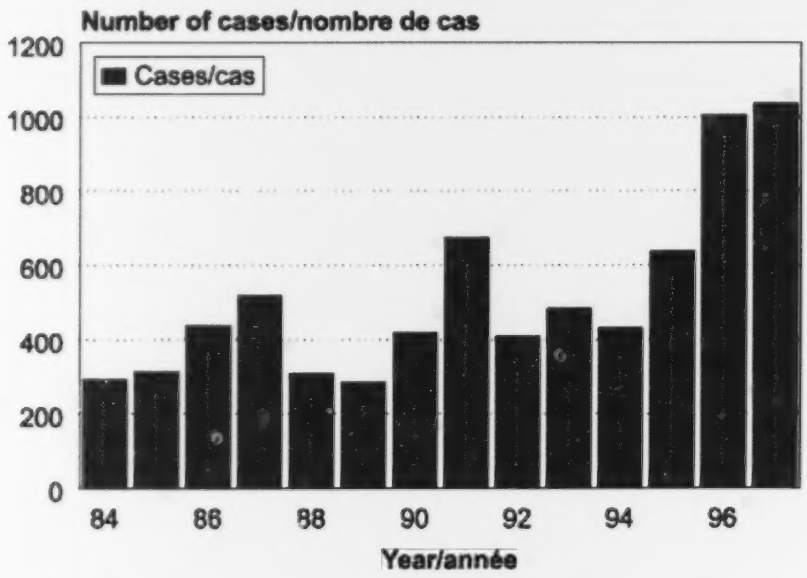
PREAMBLE - MALARIA

Worldwide, as many as 300 million people contract malaria each year, and the World Health Organization estimates that between 1.5 and 3 million people die of the disease annually.

Malaria is not foreign to Canada. Over the past 5 years the number of imported cases of malaria has dramatically increased. In 1996, 1003 cases were reported in Canada - a 133% increase from the 430 cases seen in 1994 (Figure 1). Preliminary data for 1997 indicate that there were 1,029 cases reported, 5 to 10 times more than the per capita rate reported in the United States, also based on preliminary data from the US Centers for Disease Control and Prevention (CDC) (M. Parise, CDC, Atlanta: personal communication, 1999). Ten percent of the Canadian population travels to international destinations (excluding the United States) annually and many travel through malaria-endemic areas. Due to the anticipated increase in Canadians travelling and the changing geographic distribution of malaria worldwide, the rate of imported malaria in Canadians is likely to increase.

Figure 1 Trends in reported malaria cases, Canada, 1984-1997



This issue of the CCDR is devoted mainly to malaria. The first article provides a summary of Canadian deaths that resulted from contracting malaria abroad. It

is followed by a summary of three cases of malaria associated with the transfusion of blood components. The risk of transfusional malaria is extremely low in non-endemic countries such as Canada. This report also summarizes the current Canadian blood donor safety measures to minimize the risk of malaria transmission. Finally, in this issue you will find a reprint of Appendix I from the ***1997 Canadian Recommendations for the Prevention and Treatment of Malaria Among International Travellers*** *which lists the malaria risk by geographic areas in countries with endemic malaria. This appendix will assist you in determining the malaria risk and the appropriate recommended prophylaxis for the patient planning to travel.*

A complete copy of the ***1997 Canadian Recommendations for the Prevention and Treatment of Malaria Among International Travellers****, prepared by the Committee to Advise on Tropical Medicine and Travel, can be accessed through the Laboratory Centre for Disease Control (LCDC) Web page <http://www.hc-sc.gc.ca/hpb/lcdc/malar97/index.html> and through the LCDC fax retrieval system, FAXlink. To access FAXlink, call (613) 941-3900 using the handset of your fax machine and follow the instructions. A printed version can be obtained from the Canadian Medical Association through the Member Service Centre at (613) 731-8610 ext. 2307 or (888) 855-2555. It is anticipated that these recommendations will be updated in the fall of 1999.*

We hope that this issue will emphasize the potential risks of acquiring malaria and the importance of being vigilant in its prevention, diagnosis, and treatment.

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MALARIA DEATHS IN CANADIAN TRAVELLERS

Introduction

Preventable malaria-associated morbidity and mortality continues to occur in Canadian travellers. In 1997, 1,036 cases of malaria were reported in Canadian travellers, representing a 238% increase since 1994 (M.J. Garnett, Laboratory Centre for Disease Control, Ottawa: personal communication, 1998). The risk factors for malaria infection and mortality among Canadian travellers have been described previously[1-4]. Risks for malaria infection include inappropriate recommendations for malaria prevention by health-care providers, and ignorance or lack of compliance with recommendations by the travelling public. Risks for mortality include the traveller's delay in seeking medical attention for fevers, inadequate access to parenteral therapy for severe malaria in Canada, and delayed or inadequate care by Canadian physicians and hospitals[4,5]. Four recent deaths due to malaria are reported here.

Case Reports

Case 1: A 39-year-old male had been working in the oil fields of Zambia as a cook and was holidaying in Cuba on his way back home to Quebec. Before his departure from Africa, he was complaining of fever and chills; his use of malaria chemoprophylaxis was unknown. He was found unconscious in his accommodation in Cuba with signs of vomiting. Upon transfer to a local hospital, he was found to have jaundice, hyponatremic dehydration, renal failure, and severe metabolic acidosis. Subsequent to intubation and rehydration he regained consciousness. A blood smear was reported as positive for *Plasmodium vivax* (5,000/mm^3) and he was treated with oral chloroquine. On 28 March 1998, 2 days after his admission to hospital in Cuba, he was medivaced to Montreal. He arrived at the Montreal General Hospital intensive care unit in a coma with a serum K^+ of 7.8 mmol/L, creatinine 655 µmol/L, pH 7.1, hemoglobin 47 g/L, glucose 0.7 mmol/L and an 18% parasitemia with *P. falciparum*. There were no *P. vivax* parasites identified. He had an asystolic cardiac arrest and died 1.5 hours after arrival. An autopsy revealed features of severe and complicated malaria including adult respiratory distress syndrome and cerebral edema.

Case 2: A 31-year-old female, who had immigrated to Canada from Gabon, travelled back to Gabon for several weeks and did not take malaria prophylaxis. She was admitted for plastic surgery to a Montreal hospital 6 weeks after her return to Canada in apparent good health. A pre-operative medical examination, which included a complete blood count, 7 days before surgery was reported as normal. She had successfully undergone plastic surgery with a general anaesthetic in the past. The day of her surgery she had indicated that she was not feeling well but her vital signs were normal. She had an uneventful 2-hour intra-operative course and her stay in the recovery room was uncomplicated until 90 minutes post-operatively when the nurse noticed a moderate amount of sero-sanguinous oozing from the dressing. One hour later, the patient became unresponsive, desaturated, and had a cardiorespiratory arrest with ventricular fibrillation. She was resuscitated but remained

unresponsive and obtunded. At the time of the post-arrest resuscitation, her K^+ was 8.2 mmol/L, hemoglobin 26 g/L, and she had 5.8% parasitemia with *P. falciparum.* Despite intravenous quinidine and clindamycin, the patient died 48 hours after surgery on 22 January 1997. An autopsy revealed pulmonary congestion with heart failure, disseminated intravascular coagulation, massive intravascular hemolysis, and acute bronchopneumonia with septicemia. Her hemoglobin electrophoresis was normal except for a Philadelphia trait and her glucose 6-phosphate dehydrogenase was normal.

Case 3: A 29-year-old Canadian male was employed for 2 months as a miner in rural Zambia. While in Zambia, his compliance with mefloquine prophylaxis was sporadic. He returned to Ontario on 5 June 1998 and later that same day began to feel unwell. On 6 June, he developed fever, chills, and cough and sought medical attention at the emergency department of the local hospital. He told the emergency physician he was worried that he had malaria and two of his friends had recently contracted malaria while working with him in Africa. His temperature was recorded as 40° C and his platelet count was low at 50 billion/L. Thick and thin smears for malaria were performed and interpreted as negative by the on-call pathologist. He was discharged on clarithromycin, salbutimol, and cough medicine. No repeat smears were requested. He was informed to wait 48 hours and see a physician if he had not improved. He was nursed at home by his wife who was 8 months pregnant. On the morning of 8 June, he went into a coma and died several hours later. Review of the malaria smear from 6 June indicated the presence of *P. falciparum* malaria and autopsy findings supported this as the cause of death.

Case 4: A 22-year-old female left Canada in April 1998 to do volunteer community work in Nigeria, in a village near Ibadan. She was 3 months pregnant at departure. She sought pre-travel advice while in Canada. No travel immunizations were recommended. Antimalarials were not given. She stated that she was told the drugs were contraindicated in pregnancy. While in rural Nigeria, she developed fever. It was 10 days before she got to medical assistance in Ibadan. She subsequently developed severe *P. falciparum* malaria requiring hemodialysis. On 14 July, in her sixth month of pregnancy, she spontaneously delivered a stillborn male infant. She is currently being assessed for any other complications related to her infection and the medical care she received in Nigeria.

Discussion

These four cases illustrate several known risk factors for malaria infection and associated mortality, and raise several new questions. All four individuals acquired their infection in Africa. Three cases (Cases 2, 3, and 4) were either on no or irregular malaria prophylaxis; one case (Case 4) had been advised, inappropriately, not to take chemoprophylaxis. Laboratory diagnostic errors occurred in two cases: a missed *P. falciparum* in Case 3 and a speciation error (*P. vivax* for *P. falciparum*) in Case 1.

Cases 1 and 3 illustrate a less commonly described problem. Travellers, especially those living and working abroad, often discontinue malaria chemoprophylaxis and rely on local medical care if they develop a "malaria-like" fever. Cases 1 and 3 depended on such help. The delays and problems associated with seeking help in a country where differences in diagnostic services, health care, and language can have a negative impact on outcome. Access to accurate malaria diagnosis and appropriate antimalarials may be problematic in Africa as is access to parenteral therapy for severe malaria in Canada[4].

Case 2 is more unusual. Six weeks after returning from a trip to Gabon, and 1 week after being declared fit for surgery in a "pre-op" medical examination that

included a complete blood count (CBC), the patient developed severe hemolysis-induced hyperkalemia and died. (The CBC peripheral "thin" smear was later examined and found negative for malaria.) The interaction of surgery and/or anaesthesia and *P. falciparum* infection is poorly understood. It may be prudent to do malaria smears (thick and thin) as part of the pre-operative preparation in any person who has been in the malarial tropics within the previous 4 months.

Case 4 illustrates the severe consequences of malaria in pregnancy. Malaria parasitemia is higher in pregnancy, and the consequences for mother and child are particularly serious. For this reason, malaria control programs worldwide make malaria prevention in pregnancy through chemoprophylaxis a principal focus, yet travellers are too often poorly informed about the risk.

The worldwide incidence of malaria is not decreasing and in many areas, such as India, it may be on the increase[6]. The increasing incidence of malaria in Canadians is due to a result of increased exposure to drug-resistant malaria, inadequate understanding and compliance with preventive (measures to reduce insect bites and chemoprophylaxis), and increased efficiency of case reporting. These reported cases point to the need for better education of both Canadian travellers and health-care providers about malaria prevention, diagnosis, and treatment.

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Source:

C Quach, MD, McGill Centre for Tropical Disease, Montreal General Hospital and McGill University, Montreal QC; K Kain, MD, Tropical Disease Unit, The Toronto Hospital and the University of Toronto, Toronto, D MacPherson, MD, Department of Pathology and Molecular Medicine, Hamilton Regional Laboratory Medicine Program and McMaster University, Hamilton ON; J Mendelson, MD, J MacLean, MD, McGill Centre for Tropical Disease, Montreal General Hospital and McGill University, Montreal QC.

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TRANSFUSION-TRANSMITTED MALARIA IN CANADA

Introduction

The risk of acquiring malaria via the transfusion of blood components is extremely low in non-endemic countries such as Canada and the United States. A transfusional malaria risk of 0.25 cases/million donor units has been estimated in the United States[1], with a fairly steady incidence of one to three cases per year reported by the United States Centers for Disease Control and Prevention[1-4]. In contrast, the risk in endemic countries maybe more than 50 cases/million donor units[5]. In the last 5 years, the post-transfusion adverse events program of the Bureau of Biologics and Radiopharmaceuticals, Health Canada, has received reports from the Canadian Red Cross on three cases of malaria associated with the transfusion of blood components. These cases are briefly reported here (a report of one of these cases has been previously published[6]), and current blood donor safety measures are summarized to decrease the risk of malaria transmission.

Case Histories

Case 1: On 2 May 1997, a 62-year-old female in Lindsay, Ontario, received two units of red blood cells and one unit of fresh frozen plasma. Three weeks later, she began to experience recurrent fevers. Approximately 5 weeks after symptom onset, *Plasmodium falciparum* malaria was diagnosed by blood smear, and she was successfully treated. Malaria species diagnosis was subsequently confirmed by polymerase chain reaction (PCR)-based methods [7,8]. The woman had no history of residence or travel outside the country. Two red-cell donors were investigated. One had no history of malaria infection or exposure and had repeatedly negative blood smears. Blood from this donor was also negative for *P. falciparum* malaria by PCR and by histidine-rich protein II antigen detection[7,8]. The other was a 19-year-old woman from Ghana, who came to Canada in 1993 and was a first-time donor. This donor had answered negatively to all questions related to malaria on the donor questionnaire at the time of donation on 22 April. According to the donor's father, she had not been ill with malaria since her arrival in Canada. However, she was not available for follow-up, and it was not possible to obtain further information or blood samples from this donor for malaria testing.

Case 2: On 17 and 18 February 1995, a 24-year-old female in Hawkesbury, Ontario, received four units of red cells. She became febrile 15 days after transfusion, and 3 days after onset of fever was diagnosed with *P. falciparum* malaria by blood smear at an Ottawa hospital. The malaria species identification was confirmed by PCR- based methods. This case responded to anti-malarial therapy. One of the four investigated donors was a male originating from Mali, Africa, who had been treated for malaria in 1991 with chloroquine. He had been in Canada for the past 4 years and was free of any malaria symptoms during this period. However, PCR testing confirmed the presence of *P. falciparum* malaria in his blood. DNA was extracted from both donor and recipient blood samples and the parasite isolates were subjected to

DNA fingerprinting analysis[9,10]. The analysis revealed a match between the isolates, confirming the donor as the source of infection.

Case 3: This case has been previously reported by Long et al.[6] On 18 August 1994, a 63-year-old male was admitted to hospital with fever and convulsions in Chateauguay, Quebec. He was diagnosed with *P. falciparum* malaria 3 weeks later by blood smear, and treated successfully. Between 1 August and 1 September 1994, he had received 25 units of blood components (red cells, platelets, and plasma), and an investigation of multiple donors was required. A donor from Cameroon with a history of malaria there 13 years earlier was discovered. As with the Case 2 donor, this donor had been symptom-free for more than 3 years. After an intensive search, a *P. falciparum* gametocyte and rare trophozoites were found in this donor's blood smears. The case patient had received a platelet donation from this donor 16 days prior to the admission for fever.

Lookback investigations were carried out after identification of the two donors with malaria in Cases 2 and 3 and the donor implicated in Case 1; no other malaria infections in recipients were discovered.* All three of these donors have been coded to prevent further donations of components for transfusion.**

Discussion

The three cases of transfusion-transmitted malaria described above are of public-health importance for several reasons.

First, all three were caused by *P. falciparum*, which may be associated with a potentially fatal outcome, particularly if there are delays in recognition and treatment[4,11,12]. Cases 1 and 3 were diagnosed after approximately 6 and 3 weeks of symptoms, respectively, while Case 2 was diagnosed relatively soon after symptom onset. In all cases, astute laboratory personnel made the diagnosis while examining blood smears ordered for reasons other than malaria. Fortunately, there were no fatalities among these cases. In the United States, *P. falciparum* has resulted in two recent fatalities, and was also the most common cause of transfusion-transmitted malaria, responsible for 37% of 91 cases reviewed[4]. Cases of imported *P. falciparum* malaria are increasing in Canada as more Canadians travel to malaria-endemic areas, and as drug-resistant *P. falciparum* malaria continues to evolve and spread[13,14].

Second, confirmed or suspected source donors met donor screening criteria designed to prevent transfusion malaria. The donors implicated in Cases 2 and 3 were asymptomatic carriers of *P. falciparum* malaria. At the time of their donation, persons with a history of malaria who had been symptom-free for 3 years were allowed to donate. As a result of these two cases, the Bureau of Biologics and Radiopharmaceuticals, Health Canada, and the Canadian Red Cross Society changed the deferral criterion for past history of malaria. Beginning in July 1995, donors reporting a history of diagnosis or treatment for malaria any time in the past were permanently deferred from donating components for direct transfusion. However, as illustrated by Case 1, even with this added precautionary measure, complete prevention of transfusion-transmitted malaria may not be possible. In the absence of any practical donor screening program for malaria, the management of the risk of malaria from blood transfusion is entirely based on the donor's answers to specific screening questions. Donors may give inaccurate information intentionally or unintentionally because they misunderstand the question posed or because they are unaware or have forgotten that they previously have had malaria.

Third, it is unusual that *P. falciparum* persisted in the donors involved in these cases for over 3 years after leaving endemic areas. In Case 2, and likely in the

other cases, there is a history of preceding inadequate therapy for malaria with chloroquine. Such non-curative therapy may facilitate persistent infection, which increases the risk of transfusion malaria in the population, particularly if infected individuals develop a semi-immune state (minimal symptoms but persistent parasitemia).

Finally, it is notable that transmission to Case 3 occurred through the transfusion of a platelet rather than a red-cell unit, and despite the apparent low level of parasitemia in the donor. This observation suggests that a small number of infected red cells (perhaps even a single infected erythrocyte) are sufficient to transmit the disease.

Conclusion

The 1995 decision to defer those with a past history of malaria from donating blood have resulted in Canadian criteria that are more stringent than those in the United States, where the Food and Drug Adminstration and the American Association of Blood Banks do not require permanent deferral due to a history of malaria[16]. (American deferral criteria for malaria are currently under review.) The 1995 decision was made to reduce the risk of transfusion-transmitted malaria in Canada to an absolute minimum, recognizing that many new Canadians will be prevented from donating; a "history" of malaria is common in these individuals because fevers are often labelled as malaria in endemic countries without appropriate laboratory confirmation by bloodsmear. It is also worth noting that Canada routinely reports five to 10 times the per capita rate of imported malaria than that reported in the United States. This may result, in part, in a greater risk of malaria transmission through transfusion in Canada, supporting the more stringent Canadian donation criteria. Nevertheless, with large-scale population movements globally and the continued increase in travel by all Canadians, a small risk will remain. Transfusion-transmitted malaria should be considered in transfusion recipients who have undiagnosed symptoms consistent with malaria, such as fever or chills, and thick and thin blood smears should be urgently examined to exclude this possibility.

Acknowledgements

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Note: An April issue of the ***Morbidity and Mortality Weekly Report*** will contain a summary of transfusional-transmitted malaria in the United States.

* In WHO terminology[15], Cases 2 and 3 can clearly be classified as induced malaria due to transfusion. Induced refers to malaria transmitted by mechanical means such as transfusion of blood or blood products, organ transplantation, deliberate infection for malaria therapy, or contaminated needles or injection equipment. Strictly speaking, Case 1 would be classified as a cryptic case because confirmation of infection in the suspect donor was not possible and thus the source of transmission was not conclusively identified.

** Plasma donations for further manufacturing can still be accepted from donors with a past history of malaria, since plasma is acellular. Any parasitized red cells which may inadvertently be present would be excluded during cryoprecipitation and fractionation, and merozoites would not survive in the absence of red cells and would likely be killed or eliminated by the manufacturing process (H. Chong, Bureau of Biologics and Radiopharmaceuticals, Health Canada, Ottawa: personal communication, 1998). No cases of malaria attributable to fractionated products have been reported.

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APPENDIX - MALARIA RISK BY GEOGRAPHIC AREAS IN COUNTRIES WITH ENDEMIC MALARIA

APPENDIX

Country	Areas of risk within country	Recommended Regimens
Afghanistan	All	Mefloquine
Algeria	Very limited in Sahara region.	None
Angola	All	Mefloquine
Argentina	Rural areas near Bolvian and Paraguay borders.	Chloroquine
Azerbaijan	Souther border areas and Khachmas region in north.	Chloroquine
Bangladesh	All, except no risk in Dhaka.	Mefloquine
Belize	Rural areas including resort areas, off shore islands, and forest preserves, except no risk in central coastal Belize District.	Chloroquine
Benin	All	Mefloquine
Bhutan	Rural areas, in districts bordering India.	Mefloquine
Bolivia	Rural areas (< 2,500 metres) only, except no risk in Oruro Department and Province of Ingavi, Los Andes, Omasuyos, Pacajes, Southern and Central Potosi Department.	Mefloquine
Botswana	Northern part of country (North of 21° South) from November to June.	Mefloquine
Brazil	Rural areas of Acre, Amazonas, Goias, Maranhao, Mato Grosso and Para States, and territories of Tocantins, Amapa, Rondonia, Roraima. **Note:** No risk for travellers to coastal states	Mefloquine

	from the horn to Uruguay border and Iguassu Falls.	
Burkina Fasa	All	Mefloquine
Burma: see Myanmar		
Burundi	All	Mefloquine
Cambodia	All, except no risk in Phnon Penh and around Tonle Sap. Malaria risk exists in Angkor Wat.	Mefloquine (Doxycycline on western borders)
Cameroon	All	Mefloquine
Cape Verde	September to November Sao Tiago Island.	None
Central African Republic	All	Mefloquine
Ceylon: see Sri Lanka		
Chad	All	Mefloquine
China	Rural areas only in Anhui, Hainan, Fujian, Guangdong, Guangxi, Buizhou, Jiangsu, Jiangxi, Shandong, Sichuan, Yunnan and Zhejiang Provinces/autonomous regions. Transmission occurs < 1,500 metres from July to November north of 33° North, from May to December between 33° North and 25° North, and throughout the year below 25° North. **Note:** Travellers visiting cities and popular rural tourist routes are generally not at risk and require no prophylaxis.	Chloroquine (Mefloquine for southern provinces bordering Myanmar, Laos and Vietnam)
Colombia	In general, rural areas only, no risk in Bogota and vicinity.	Mefloquine
Comoros	All	Mefloquine
Congo	All	Mefloquine
Costa Rica	Rural areas only (including tourist areas). No risk in central highlands. Limited risk in rural areas of Alajuela, Guanacaste, Limon, Heredia and Los Chiles provinces.	Chloroquine
Côte d'Ivoire (formerly Ivory Coast)	All	Mefloquine

Dijbouti	All	Mefloquine
Dominican Republic	All rural areas. Highest risk in areas bordering Haiti. No risk in tourist areas.	Chloroquine
Ecuador	All provinces along eastern border and Pacific coast: Esmeraldas, Guayas, Manabi, El Oro. Rural areas in provinces of Canar Cotopasi, Los Rios, Morona, Santiago, Napo, Pastaza, Zamora, Sucumbios, Chinchipe and Pinchincha. (No risk in Quito and vicinity, the central highland tourist areas or the Galapagos Islands.) Chloroquine resistance in Guayaquil.	Mefloquine
Egypt	El Faiyum area and part of Southern (upper) Egypt. (No risk in main tourist areas including cruises.)	Chloroquine
El Salvador	Rural areas only.	Chloroquine
Equatorial Guinea	All	Mefloquine
Eritrea	All, except > 2,000 metres. No risk in Asmara.	Mefloquine
Ethiopia	All, no risk in Addis Ababa and > 2,000 metres.	Mefloquine
French Guiana	All	Mefloquine
Gabon	All	Mefloquine
Gambia	All	Mefloquine
Ghana	All	Mefloquine
Guatemala	Rural areas only, except for no risk in central highlands (> 1,500 metres).	Chloroquine
Guinea	All	Mefloquine
Guinea-Bissau	All	Mefloquine
Guyana	Rural, in all interior regions including Rupununi, North West Regions and along Pomeroon River. Only Georgetown and New Amsterdam are transmission free.	Mefloquine
Haiti	All	Chloroquine
Honduras	Rural areas only.	Chloroquine
India	All areas < 2,000 metres including Delhi and Bombay, except no	Mefloquine

	transmission in Himachal Pradesh, Jammu, Kashmir, and Sikkim.	
Indonesia	In general rural areas only, except high risk in all areas of Irian Jaya. No risk in cities of Java and Sumatra or resort areas in Java or Bali. **Note:** Transmission is largely confined to rural areas not visited by most tourists.	Mefloquine
Iran, Islamic Republic of	Rural areas only (March to November) in the provinces of Sistan-Baluchestan, Kermany and Hormozgan, the southern parts of Fars, Kohgiluyh-Boyar, Lorestan and Chahar Mahai-Bakhtiani, and the north of Khuzestan.	Mefloquine
Iraq	All areas in northern region (May to November); Duhok, Erbil, Basrah, Tamim, Ninawa and Sulaymaniya province.	Chloroquine
Ivory Coast: see Côte d'Ivoire		
Kenya	All, except low risk in city of Nairobi and > 2,500 metres.	Mefloquine
Lao People's Domestic Republic	All areas, except no risk in city of Vientiane.	Mefloquine
Liberia	All	Mefloquine
Libyan Arab Janahiriya	Limited risk in two small foci in southwest of country from February to August.	None
Madagascar	All, highest in coastal areas.	Mefloquine
Malawi	All	Mefloquine
Malaysia	In general, rural areas only including Sarawak (NW Borneo), but throughout Sabah (NE Borneo). Otherwise, none in urban and coastal areas.	Mefloquine
Mali	All	Mefloquine
Mauritania	All areas, except no risk in the northern areas of Dakhlet-Nouadhibou and Tiris-Zemour. In Inchiri	Mefloquine

	and Adrar, risk from July to October.	
Mauritius	Rural areas only, except no risk in Rodrigues.	Chloroquine
Mayotte	All	Mefloquine
Mexico	Rural areas only including Oaxaca, Chiapas, Sinaloa, Michoacan, Quintana Roo, Guerrero, Campeche, Tabasco, Nayarit, Chihauhua and Hidalgo. No risk in resort areas.	Chloroquine
Morocco	Very limited risk in rural areas of some provinces.	None
Mozambique	All	Mefloquine
Myanmar (formerly Burma)	Rural areas. **Note:** Travellers to Yangon (Rangoon) and Mandalay are not at risk and need no prophylaxis.	Mefloquine (Doxycyline for Thai borders)
Namibia	All areas of Ovamboland and Caprivi Strip.	Mefloquine
Nepal	Rural areas in Terai District and hill districts < 1,200 metres. No risk in Kathmandu.	Mefloquine
New Hebrides: see Vanuatu		
Nicaragua	Rural areas and outskirts of Bluefields, Bonanza, Chinandega, Leon, Puerto Cabeza, Rosita and Siuna.	Chloroquine
Niger	All	Mefloquine
Nigeria	All	Mefloquine
Oman	All	Mefloquine
Pakistan	All including cities in areas < 2,000 metres.	Mefloquine
Panama	Rural areas north and west of Canal. Rural areas south and east of Canal. No risk in the Canal Zone or in Panama City.	Chloroquine, Mefloquine
Papua New Guinea	All	Mefloquine
Paraguay	In general, only rural areas bordering Brazil.	Chloroquine
Peru	In general, all rural areas, except no risk in Lima and vicinity and coastal areas South of Lima. **Note:** travellers to Lima and vicinity and to highland	Chloroquine, Mefloquine for borders with Brazil and Ecuador

	tourist areas (Cuzco, Machu Picchu) are not at risk and need no prophylaxis.	
Philippines	Rural areas only, except no risk in Manila and province of Bohol, Catanduanes, and Cebu. Rural areas of Luzon, Basilian, Mindoro, Palawan, Mindanao, and Sulu-Archipelago.	Chloroquine, Mefloquine
Rwanda	All	Mefloquine
Sao Tome and Principe	All	Mefloquine
Saudi Arabia	All areas except the Eastern, Northern and Central provinces, the high altitude areas of Asir province, and the urban areas of Jeddah, Mecca, Medina, and Taif.	Chloroquine
Senegal	All	Mefloquine
Sierra Leone	All	Mefloquine
Solomon Islands	All	Mefloquine
Somalia	All	Mefloquine
South Africa	Rural areas (including game parks) in the northern, eastern and western low altitude areas of the Transvaal and the Natal Coast north of 28° South.	Mefloquine
Sri Lanka (formerly Ceylon)	All areas, except Colombo, Kalutara, Nuwara Eliya.	Mefloquine
Sudan	All	Mefloquine
Suriname	Rural areas only, except no risk in Paramaribo district and coastal areas north of 5° North.	Mefloquine
Swaziland	All lowland areas.	Mefloquine
Syrian Arab Republic	Rural areas only (May to October) especially along northern border. No risk in districts of Damascus, Deir-es-zor and Sweida.	Chloroquine
Tajikistan	In southern border areas.	Chloroquine
Tanzania, United Republic of	All	Mefloquine
Thailand	Rural border areas only (not visited by most travellers), no risk in	Doxycycline

	Bangkok, Chiangmai, Pattaya or beach resort areas. Mefloquine resistance. Doxycycline recommended on borders with Myanmar and Cambodia for overnight exposure in rural areas.	
Togo	All	Mefloquine
Turkey	Cukurova/Amikova areas and southeast Anatolia (April to October). No risk in main tourist areas in west and south-west.	Chloroquine
Uganda	All	Mefloquine
United Arab Emirates	Risk in foothills and valleys in the mountanous regions of northern Emirates. No risk in cities of Dubai, Sharjah, Ajman, Umm al Qaiwain and Emirate of Abu Dhabi.	Chloroquine
Vanuatu (formerly New Hebrides)	All, except no risk on Futuna Island.	Mefloquine
Venezuela	Rural areas of all border states and rural areas of the states of Barinas, Monagas, Sucre, Tachira, Amazonas, Delta Amacuro, Apure, and Bolivar.	Mefloquine
Viet Nam	Rural areas only, no risk in Red Delta and coastal plain north of Nha Trang.	Mefloquine
Yemen	All, except no risk in Aden and airport areas.	Mefloquine
Zaire (Republic of Congo)	All	Mefloquine
Zambia	All	Mefloquine
Zimbabwe	All, except no risk in cities of Harare and Bulawayo.	Mefloquine

Source: *Committee to Advise on Tropical Medicine and Travel (CATMAT) 1997. Canadian recommendations for the prevention and treatment of malaria among international travellers. CCDR 1997;23S5:17-21.*

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Public Health Agency of Canada | Agence de santé publique du Canada

Canada

Public Health Agency of Canada (PHAC)

Canada Communicable Disease Report CCDR

Volume 25-06
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Announcement

INTERNATIONAL TRAVEL AND HEALTH

Vaccination Requirements and Health Advice

The 1999 edition of **WHO's *International Travel and Health*** has just been published. This booklet is addressed to national health administrations and to practising physicians, tourist agencies, shipping companies, airline operators, and other bodies who are called upon to give health advice to travellers.

A convenient country-to-country list of required vaccinations is provided, together with pertinent information on the malaria situation, for every country in the world. For malaria, epidemiologic details are given for all countries with endemic areas, including notes on geographic and seasonal distribution, altitude, predominant species, and status of resistance. The recommended chemoprophylactic regimen is also given for each country with malarious areas. In view of the deteriorating malaria situation, information on prophylaxis and treatment is especially detailed. Further assistance is provided through a fold-out map summarizing recommended prophylactic regimens by area and a table indicating doses of antimalarial drugs for children. A section on multidrug-resistant malaria is also included.

Other chapters cover certain health hazards to which the traveller may be exposed and indicate the areas in which these hazards are most likely to occur. The booklet also recommends a number of precautions that the wise traveller should take when visiting unfamiliar places.

This booklet can be obtained after April 1, 1999, from the **Publications Department, Canadian Public Health Association, 400-1565 Carling Avenue, Ottawa, Ontario, K1Z 8R1; telephone (613) 725-3769. Price per copy is $27.73 (including postage, handling, and GST)**.

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RESPIRATORY VIRUS SURVEILLANCE

FluWatch Project

FluWatch, Canada's national influenza surveillance program, began its third season on 14 October 1998. This article provides a brief summary of the influenza activity until 26 February 1999.

Currently, FluWatch has 184 sentinel participating physicians representing 38% (110/288) of the census divisions in Canada. The weekly rates of influenza-like illness (ILI) reported to FluWatch (Figure 1) during the current season have shown a slight upward trend since the end of January; however, the rates observed are similar to those reported in the previous two seasons during the same period. Figure 2 illustrates the standardized cumulative rates of ILI by province for this season.

Since September 1998, the FluWatch program has received reports on 31,604 laboratory tests for influenza; 2,703 (8.6%) have been confirmed influenza type A and 258 (0.8%) as influenza type B. Of the 2,703 type A isolates, 29 were subtype H3N2, and 2,674 have not been subtyped. The provincial distribution of these influenza A isolates is as follows: Newfoundland (15), Nova Scotia (11), New Brunswick (29), Quebec (605), Ontario (758), Manitoba (178), Saskatchewan (239), Alberta (649), and British Columbia (219). The influenza type B isolates have the following distribution: Quebec (11), Ontario (226), Saskatchewan (6), Alberta (4), and British Columbia (11).

Figure 1 Influenza-like illness (ILI), weekly reporting rates, Canada, 1998-1999, 1997-1998, and 1996-1997

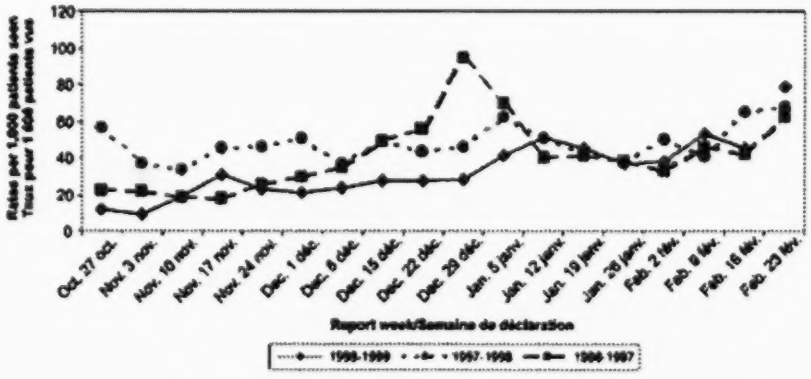
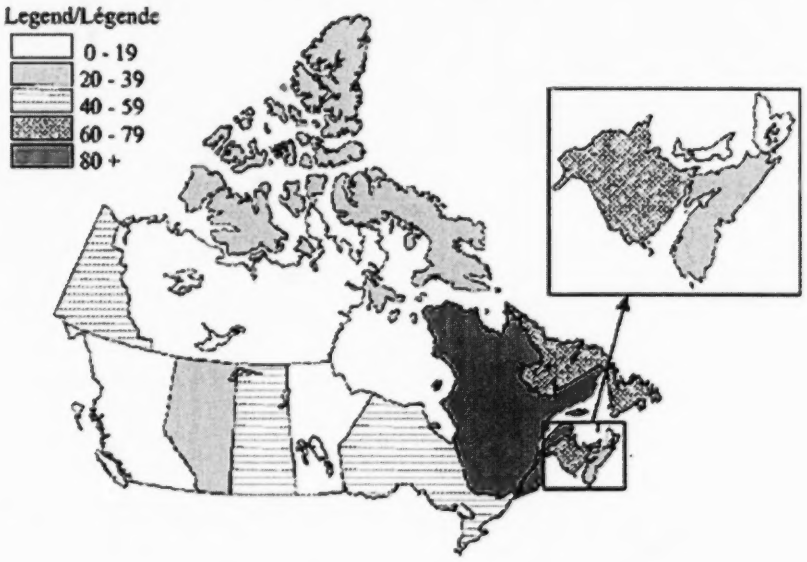


Figure 2 Standardized rates of ILI across Canada, by province, reported

to FluWatch, 14 October 1998 to 23 February 1999*



* Newfoundland: Crude rate

FluWatch program reports can be assessed through the FluWatch Website <http://www/hc-sc.gc.ca/hpb/lcdc/bid/dsd/fluwatch/index.html>. Information can also be obtained from the ***Infectious Diseases News Brief*** Website <http://www/hc-sc.gc.ca/hpb/lcdc/bid/dsd/news/index.html>. World Health Organization influenza reports can be accessed through the FluNet Website <http://rhone.b3e.jussieu.fr/flunet/www/>.

Source:

L Pelletier, MD, MPH, Chief, Division of Respiratory Diseases, P Buck, DVM, MSc, Field Epidemiologist, S Herman, C Scott, B Winchester, MSc, P Zabchuk, P Sockett, PhD, Chief, Division of Disease Surveillance, Bureau of Infectious Diseases; M. Vanderkloot, BA, Bureau of Surveillance and Field Epidemiology, LCDC, Ottawa ON.

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